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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/724,004	11/26/2003	Alexei A. Erchak	16459-007001/ LD-7	7531
26161	7590	08/10/2004	EXAMINER WILSON, SCOTT R	
FISH & RICHARDSON PC 225 FRANKLIN ST BOSTON, MA 02110			ART UNIT 2826	PAPER NUMBER

DATE MAILED: 08/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/724,004

Applicant(s)

ERCHAK ET AL.

Examiner

Scott R. Wilson

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 22 April 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-47 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5, 8, 9, 11, 13-15, 17-23, 25, 30, 31, 33-35, 37 and 42-45 is/are rejected.
- 7) ☒ Claim(s) 6, 7, 10, 12, 16, 24, 26-29, 32, 36, 38-41, 46 and 47 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Specification***

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: LIGHT EMITTING DEVICES WITH IMPROVED EXTRACTION EFFICIENCY.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 22 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The language "the pattern does not extend beyond the first layer" is indefinite, since it fails to specify the dimension one of ordinary skill in the art would measure the distance in to determine how far the pattern extends. It fails to specify the direction to measure the extent of the pattern in to determine if it extends as far as the first layer, into the first layer or beyond the first layer.

Claim 17 recites the limitation "first layer". There is insufficient antecedent basis for this limitation in the claim.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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Claims 1-5,8,9,11,13-15,17-21 are rejected under 35 U.S.C. 102(b) as being anticipated by Lester. As to claim 1, Lester, Figures 1 and 7, discloses a light emitting device comprising a multi-layer stack of materials including a layer of n-doped material (13)(col. 2, line 58), a layer of p-doped material (14)(col. 2, line 59), and a light generating region (18)(col. 2, lines 59-60), and a layer of reflective material (15)(col. 3, lines 14-17) that is capable of reflecting at least 50% of light generated by the light-generating region that impinges on the layer of reflective material, wherein a surface of the layer of n-doped material is configured so that light generated by the light-generating region can emerge from the light-emitting device via the surface of the layer of n-doped material, via holes (35), the surface of the layer of n-doped material has a dielectric function that varies spatially according to a pattern, embodied by holes (35), and a distance between the layer of p-doped material (14) and the layer of reflective material (15) is less than the distance between the layer of n-doped material (13) and the layer of reflective material. Layers (13), (14) and (18) correspond to combined layer (32) of Figure 7, a p-n junction layer (col. 5, line 32).

As to claim 2, Lester discloses that the multi-layer stack is comprised of gallium nitride (col. 2, line 57), which is a semiconductor.

As to claim 3, Lester discloses that the n-doped material is an n-doped semiconductor and the p-doped material is a p-doped semiconductor (col. 2, lines 58-60).

As to claim 4, Lester, Figure 1, discloses that the light-generating region (18) is between the n-doped material (13) and the p-doped material (14).

As to claim 5, Lester, Figure 1, discloses a support (12) that supports the multi-layer stack of materials.

As to claim 8, Lester discloses that the multi-layer stack is comprised of gallium nitride (col. 2, line 57), which is a semiconductor.

As to claim 9, Lester discloses that the multi-layer stack is comprised of gallium nitride (col. 2, line 57), which is a III-V semiconductor.

As to claim 11, Lester, figure 7, discloses that the pattern (35) does not extend beyond the layer of n-doped material (13).

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As to claim 13, Lester, Figure 1, discloses that electrodes (15) and (16) are electrical contacts configured to inject current into the light-emitting device.

As to claim 14, Lester, figure 1, discloses that electrodes (15) and (16) inject current vertically into the light-emitting device, in that the current must travel vertically at some point to go from one electrode to the other.

As to claim 15, Lester, Figure 7, discloses that the pattern is formed of holes in the surface of the layer of n-doped material ((13) of Figure 1).

As to claim 18, Lester discloses that light generated in the light-generating layer (18) is transmitted to holes (35) (col. 5, lines 37-39), implying that the radiation spectrum of the emission layer is necessarily the same as the radiation spectrum of the holes.

As to claim 19, Lester discloses (Abstract) that the light-emitting device is a light-emitting diode.

As to claim 20, Lester discloses (Abstract) that the light-emitting device is a light-emitting diode.

As to claim 21, Lester discloses (Abstract) that the light-emitting device is a flat surface-emitting LED.

Claims 22, 23, 25, 30, 31, 33-35, 37 and 42-45 are rejected under 35 U.S.C. 102(b) as being anticipated by Lester. As to claim 22, Lester, Figures 1 and 7, discloses a light emitting device comprising a multi-layer stack of materials including a light-generating region (18)(col. 2, lines 59-60) and a first layer (14) supported by the light-generating region, a surface of the first layer being configured so that light generated by the light-generating region can emerge from the light-emitting device via the surface of the first layer, thereby traveling through other layers (col. 3, line 6), and the surface of the first layer has a dielectric function that varies spatially according to a pattern, in the embodiment of Figure 7, a layer of reflective material (12) that is capable of reflecting at least about 50% of light generated by the light-generating region that impinges on the layer of reflective material, wherein the light generating region (187) is between the layer of reflective material (12) and the first layer (15).

As to claim 23, Lester discloses that the multi-layer stack is comprised of gallium nitride (col. 2, line 57), which is a semiconductor.

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As to claim 25, Lester, Figure 1, discloses that the light-generating region (18) is between the n-doped material (13) and the p-doped material (14).

As to claim 30, Lester discloses that the multi-layer stack is comprised of gallium nitride (col. 2, line 57), which is a semiconductor.

As to claim 31, Lester discloses that the multi-layer stack is comprised of gallium nitride (col. 2, line 57), which is a III-V semiconductor.

As to claim 33, Lester, Figure 1, discloses that electrodes (15) and (16) are electrical contacts configured to inject current into the light-emitting device.

As to claim 34, Lester, figure 1, discloses that electrodes (15) and (16) inject current vertically into the light-emitting device, in that the current must travel vertically at some point to go from one electrode to the other.

As to claim 35, Lester, Figure 7, discloses that the pattern is formed of holes in the surface of the layer of n-doped material ((13) of Figure 1).

As to claim 37, Lester, Figure 7, discloses that the pattern is partially formed of holes in the first layer (14).

As to claim 42, Lester discloses that light generated in the light-generating layer (18) is transmitted to holes (35) (col. 5, lines 37-39), implying that the radiation spectrum of the emission layer is necessarily the same as the radiation spectrum of the holes.

As to claim 43, Lester discloses (Abstract) that the light-emitting device is a light-emitting diode.

As to claim 44, Lester discloses (Abstract) that the light-emitting device is a light-emitting diode.

As to claim 45, Lester discloses (Abstract) that the light-emitting device is a flat surface-emitting LED.

#### ***Allowable Subject Matter***

Claims 6, 7, 10, 12, 16, 24, 26-29, 32, 36, 38-41, 46 and 47 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. No prior art discloses the claimed device with

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any pattern of dielectric formations other than regular, symmetric and periodic patterns, which necessarily have a detuning parameter equal to zero. No prior art discloses the claimed device with the feature size of the dielectric pattern less than about one wavelength of generated light.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott R. Wilson whose telephone number is 571-272-1925. The examiner can normally be reached on M-F 8:30 - 4:30 Eastern.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

srw  
August 6, 2004



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